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OFFICE OF THE PRINCIPAL, RURAL EXTENSION TRAINING CENTRE
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Special feature on progress of Animal Husbandry in Bihar on the occasion of State Cattle Show at Barauni.

March '62
Phalguna-Chaitra,
1883 Saka

Progress of Bihar Goshala Development Scheme

THE important role played by the Goshalas in the success of animal husbandry programmes can ha dly be over-emphasised. Their work is limited not only to the welfare of cow and her progeny but is of great help in the improvement of local breeds and supply of milk in urban areas. Probably, this is the reason that from ancient times in our country, the goshalas have been run with public contributions and people's participation. If then Goshalas are properly developed, these places can work as centres for breed improvement and demonstrating the improved methods of growing fodder. These goshalas can be developed into cattle-breeding farms and as smaller milk dairies, thus contributing to solve the unemployment problem and milk supply to urban areas.

During the second Five-Year Plan period, the Bihar State Government worked out a Goshala Development Scheme with an estimated expenditure of about Rs. 11.23 lakhs. Under this scheme, 70 out of the total 135 goshalas in the state were taken up for development work. The goshalas are given the following assistance every year.

(1) With one bull of improved breed, a goshala is given 10 cows on the condition that it would also purchase an equal number of cows from its resources.

(2) To meet the increasing expenditure on keeping milch cows, Rs. 2000 are given as recurring grant for one year.

(3) For the proper husbandry of a female calf from an improved bull, an amount of Rs. 10 per month is given for one such female calf.

(4) A non-recurring grant of Rs. 5000 is given for the purchase of equipment and construction of building.

Under this scheme, 30 bulls and 488 cows were distributed to various goshalas during the IInd Plan period. This excludes an additional number of 200 bulls distributed for upgrading the cattle in the goshalas.

For scientific development and proper management of the goshalas, the Bihar State Federation of Goshalas and Pinjrapoles has been organised.

The assistance provided by the state government has helped the goshalas to improve their work and capacity. Most of the Goshalas have registered substantial progress. With the introduction of improved techniques of fodder production and animal husbandry, there has been an increase not only in the production of milk but the other cow-keepers in general have also been benefitted. The State Government has sanctioned an additional expenditure of Rs 3 lakhs for the development of Goshalas. With the cooperation of the people, the organisations and all those connected with Goshalas if we work hard and in a coordinated manner, the day may not be far-off when these goshalas will grow into really ideal institutions of cattle improvement; and become a source of additional employment to many.

More illustrated articles on pp. 15-23.

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OUR COVER :— Cart drawn by the bullocks is still very important in the rural economy. (Photograph by C. P. Tandan)

FROM its very inception, the Gosamvardhana Journal is serving as a forum for the promotion of cattle husbandry activities. Through its medium, the experts and scientists share their technical knowledge; research workers dilate on their precious results and the field workers narrate their valuable experiences. By disseminating basic knowledge essential to further the cause of cattle development and scientific advances, it has tried to bridge the gulf between the laboratory worker and the field worker, and serve as a liaison between the government departments and the practical worker. Thus, one of the objectives for which this periodical stands is to bring into focus, important activities launched by institutions, both official and non-official, towards Gosamvardhana.

A special feature in this issue is devoted to the animal husbandry activities in the State of Bihar. By featuring the various aspects viz : animal husbandry in Bihar in the IIIrd Five Year Plan, Goshala and Gosadan schemes; and other write ups it is intended that vital information relating to the progress should be presented to the general masses in an integrated form and circulated all over the country. It is hoped that this detailed feature would enable the animal husbandry officials, organisations and the field workers throughout the country to have an insight into the problems faced and the progress ultimately made in this State in the sphere of cattle development.

It would be our endeavour to project the great strides, that are being made in different States, in a concise form. We propose to devote every alternate issue of the Journal to such features and thereby cover animal husbandry and cattle development activities in all the States in the subsequent issues. For success in this, we bank upon the cooperation of the Directors of Animal Husbandry. We sanguingly trust it will be extended, as this time, the Director of Animal Husbandry Bihar and the Cattle Show Officer, Patna, have been of special assistance to us. We are thankful to them.

EDITORIAL

Animal Husbandry Activities in the Different States

ARTIFICIAL BREEDING

of Cattle as it differs from

NATURAL BREEDING

BY

Shri C.B. Singh

CENTURY after century man has aimed at making animals serve his purpose better by breeding the best bull to the best cow in the hope of obtaining better progeny. Originally the demands of man were few and the human population was considerably smaller so the production of just a little extra milk than the cow needed for her calf was enough to meet human requirements. Now with the fast increasing population, better standards of living and greater demands, mere selection and culling would not bring about the required improvements in the cattle. To achieve this objective, alround efforts have to be made and modern means of breeding which besides being advantageous in many respects are most economical too, have to be adopted. This is more true in case of breeding cows artificially through artificial breeding cooperative societies and artificial breeding centres where larger number of animals are bred with superior quality bulls. Under the present day economic conditions of the country the most economic method of breeding which is artificial breeding, should be resorted to.

While impressing upon the rural cattle owner about the merits and advantages of the system of artificial breeding of cattle there are some pertinent questions coming forth. These when replied to, some of the people do not go deep and take it for granted that the new system of breeding should be good because the experts say so. Very few but sensible persons try to understand the process and feel convinced that artificial breeding should be really good in producing improved progeny. There is, however, a feeling left with many that there being a material difference in the technique of artificial breeding over that of natural service, the cow in particular should be lacking in her sexual satisfaction. May be, this is true to some extent; but nowhere in the world the cattle have ever expressed such a feeling, nor has this been indicated physically, physiologically or genetically. It is also likely that our sense of observation and means of detection, on this issue, have not been fully applied; but this much is absolutely certain that there

is no effect, what-so-ever, upon the process of reproduction and the progeny which is found perfect by all means. The chief reason being that in bovines the process of ovulation is not dependent upon the feeling of satisfaction as in the case of males; on the other hand it is regulated by the sex rythm the menstrual cycle is repeated after every 21 days.

There is a history of successful artificial insemination having been done as far back as the year 1322, but not much seems to have been explained as to the details of the ideas and steps that led to the origin of this process. Thinking can however trace back the steps that should have actually taken place in the completion of the present day process of artificial breeding.

The logical analysis of this problem could be made by tracing back along with the process of evulation in relation to breeding on the one side and by referring to the main points of difference between the artificial and natural systems of breeding on the other. In order to keep the process of reproduction continued through their progeny, nature has attached some attractions with the act of mating. At the onset of the heat the cow has a natural desire to have the bull. The ultimate object is reproduction. In order to have a clear cut conception of the analysis it would be necessary to visualise the anatomical structure of the female and the genital organs of the male and also their physiology.

It will be seen that the female genital tract is a simple structure and the male organ is still more simple to look at. In natural service at the time of mating, the bull discharges the semen into the vagina. From there the sperms move in every direction and some find their way into the cervix. From there a few go into the uterus and finally very few reach fallopian tube. There, only one sperm enters into the ovum by piercing through it. Immediately thereafter the wall of the ovum gets stiffened and no more sperm is allowed to enter into the ovum. Thus the act of fertilization takes place.

In case of artificial breeding the main difference is that of collecting the semen into an artificial vagina and depositing the same into the cervix (instead of vagina) by a nozzle.

Collection of semen artificially :—

In the process of collecting the semen, as far as possible all those conditions are created for the bull that are met in the natural course of mating. The bull is trained to jump over a cow, and the artificial vagina is prepared in a manner that the same conditions are available to the bull as in the natural service. While jumping over the cow the bull acts absolutely in the manner as at the time of natural service. The penis instead of being inserted into the genital parts of the cow is diverted towards the artificial vagina and the bull gives a thrust exactly in the same manner and with the same feeling as in the case of natural service. This is evident from the thrust and the immediate discharge of the bull. Thus in so far as the question of the bull being satisfied or not by the artificial collection of semen is concerned there is every reason to feel convinced that the bull acts absolutely in the same manner and with the same feelings as in the case of natural course; and hence the point of satisfaction if at all considered necessary, is fully met out. The semen thus ejaculated is processed by adding of egg yolk and mixed with citrate or phosphate etc. thereafter by creating conditions suitable enough for keeping the sperms viable and enhancing their longevity so as to utilise them for fertilizing the cows.

Regarding the sexual satisfaction on the part of the cow it may be stated that ovulation takes place once in every 21 days in the case of a cow and in the event of a sperm reaching the ovum, fertilisation takes place. In the process of reproduction this part alone is of vital importance which remains unchanged in the process of artificial breeding too. The remaining process is a bit changed in the case of artificial breeding where the diluted semen is taken into a glass tube or ebonite nozzle with a syringe and the semen is deposited into the cervix instead of vagina as in the case of natural mating. Thereafter the sperms follow the same course in both the cases.

Thus it will be seen that in the case of artificial breeding the main differences are :—

(1) The semen is exposed to atmospheric conditions.

(2) It is diluted with egg yolk and citrates or phosphates etc.

(3) The semen is kept for some time under changed conditions which are different from the scrotal sac of the male or genital tract of the female.

(4) The semen is deposited into the cervix instead of the vagina, and

(5) The deposition of the semen is done by a glass or ebonite tube instead of the bull organ (penis). The other chief difference observed is that in natural service the bull while jumping exerts some pressure by putting its head (the throat) over the hindquarters; while in the case of artificial breeding there is no such pressure extended and the operation of insemination is performed simply by inserting the tube into the female track.

Lot of research has been done in regard to the suitability of the diluters for the semen, its keeping quality, place of depositing the semen into the genital tract and the use of glass or ebonite tube etc. and the sperms are kept viable for several days whereafter inseminations result into successful conceptions, and improved progeny is born. Similarly the absence of pressure of the head (from ventral side) of the bull on the hindquarters of the cow, seems to have no effect on reproduction at all. So far as the question of feeling or satisfaction is concerned, no evidence of dissatisfaction has ever been traced. Thus for all practical purposes, the minor deviations adopted in the course of artificial breeding, do not exert any influence whatsoever in the act of reproduction, frequency of breeding, health of the cow or its progeny and their performance etc. On the other hand, the advantages of artificial breeding as mentioned below are so many and materially useful that for Indian conditions this method is the only single practicable source which can contribute towards maximum improvement of cattle :—

1. Artificial breeding is highly helpful in meeting the shortage of good bulls; particularly in India where superior bulls are very rare; and out of every 100 bulls, the best 20 could be selected for breeding, while the remaining 80 could be used for agricultural purposes. Thus there can be substantial economic utility of the inferior bulls as well.

2. The utility of good bulls is increased at least ten times while it could easily be increased to one hundred times by adopting careful practice of artificial breeding through higher dilutions. Under highly developed technique it is believed that a single ejaculation may provide semen good enough for 30 cows, and thus 6,000 cows can easily be bred to one bull per year by this method. Theoritically only one sperm is enough to fertilize a cow at one time and the remaining number which is in millions is just to increase the probability of the sperm reaching the ovum. Hence there is every reason to believe the multiple use of semen to greater degree.

3. The process of cross-breeding is highly facilitated

through the technique of artificial breeding as the bull does not have to mount a cow of different breeds which he could refuse to breed in certain cases.

4. The semen collected from the bull can easily be examined for physiological, genetic and biochemical studies.

5. Transportation of semen is practicable over very long distances; while it would be almost economically unsound to be transporting the bull itself from one place to another distant place for breeding the cows there. These days semen is transhipped by air round the world. This would be practically impossible if the bull was to be used physically with the cow.

6. Many diseases like Glandular Vaginities, Trichomoniases and Brucellosis etc. are easily controlled when the practice of artificial breeding is resorted to.

7. Difficulties due to difference in the size of the males and females are easily overcome.

8. Those females that do not take bulls easily and cause difficulties in conception even when the bull is mated, do conceive easily when bred artificially.

Thus in view of the multiple advantages and the present day scientific advancement when the world has become so small that the international trade and economy has become very much interconnected like the inter-provincial trade few decades back, we cannot afford to maintain old ideas and adopt obsolete practices which would withhold our advancement. These are the days when we have to be at least in line with advanced countries and adopt practices which are conducive to the rapid development of our cattle. In some other fields of our activities there may be exceptions due to climatic, religious and less scientific developmental reasons in our country, but artificial breeding is a system which can be adopted in India with advantage and efficiency as in most advanced countries of the world. The apparent drawbacks could easily be overcome with the increasing cooperation of the public particularly the cattle owners towards the use of artificial method of breeding, which is sure to help in the rapid and extensive development of the Indian cattle.

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FEEDING and MANAGING BULLS

by
DR. R.N. GOVINDASWAMI

IN recent years the increased use of the artificial insemination has reduced the task of dairy farmers of raising and caring for herd sires. However, the natural breeding method will not be wholly replaced. Because of the greatly extended use of bulls employed for artificial breeding work, where a single bull may have not 15 to 50 offsprings as in the case of a sire used in a single herd, but hundreds or even thousands of offsprings, it has become increasingly important that bulls raised as herd sires be fed and managed in the best possible manner since bulls of dairy breeds are expected to grow to be about 50 per cent heavier than the mature cows, they must receive plenty of feed of the proper kind.

Feeding The Bull Calf

The male calves not intended for breeding purpose are disposed off for veal when they are 3 to 5 weeks of age in the foreign countries. Since, this is not possible in India only the calves of good breeding should be raised to head a dairy herd. The bull calf should be fed in much the same way as heifer calves. The feeding programme, however, should provide for feeding the young bull more liberally, especially after three or four months of age. After this age has been reached, endeavour to keep the bull calf growing as rapidly as possible by supplying good pasture, high quality roughage, and a suitable grain mixture. As in the case of heifers, already pointed out, a grain mixture which is appropriately used with a particular kind of roughage for milk cows is also well adapted for the bull.

Caring For The Young Bull

Separate the young bull from heifer calves. Provide the bull calf proper housing, exercise, and special care, in addition to feeding. When the bull calf reaches the age of 5 to 6 months, he should not have opportunity to mingle with heifers or cows that are not pregnant. If all the cows or heifers in the herd are in calf, however, the bull calf under one year of age may be permited to run in the pasture with the herd. Keep the bull calf in good condition by plenty of exercise and good shelter. During winter, the stall where the bull is housed should be kept dry and clean and should have good light. In summer, the bull may be pastured with other bulls. But some shade is quite necessary for mid-day hours.

Ringing The Bull

As a matter of safety, a ring, metal or thin rope, by which the bull may be led,

should be inserted in his nose. The ring must be placed in the nose when the bull is from 9 to 12 months of age. The ring for the young bull should be light or medium weight. When the bull becomes well grown, this ring should be replaced by one of heavier weight and larger size.

Before attempting to place the ring in the bull's nose, fasten the bull securely in a strong stanchion, making sure that he cannot lunge forward upon the persons inserting the ring. The trocar and cannula are the best instruments for making the opening through the cartilage that forms the dividing wall between the nostrils. The trocar and cannula, and ring should be boiled just before they are to be used, or placed in a disinfectant solution for a few minutes.

Hold the nose firmly with one hand and push the trocar, with the cannula in place, through the nasal cartilage at a point a little above the lower end of the nostril, where the cartilage is thin. Withdraw the trocar, leaving the cannula projecting through the nose. Insert the open end of the ring or the thin rope in the small end of the cannula and remove the cannula from the nose, at the same time drawing the ring or rope through the nose. Close the ring by means of screw or tie the rope securely.

Leading The Bull

Every precaution should be taken to prevent the bull from injuring persons or animals, or doing any other damage, while he is being led about. The bull must be trained to be led at an early age. When 4 to 6 months of age, he may become readily accustomed to the halter. Lead him about the barn yard, make him familiar with different conditions, such as the noise of machinary and the sight of other animals.

Use staff always for a mature bull

Do not attempt to lead a well grown bull without a staff attached securely to a ring in his nose. The bull must be trained to the staff as well as to the halter. In leading the bull with the staff, always walk at his side and never in front of him. Keep his head held high, as a bull can do little damage with his head in that position. Watch him constantly while leading him. Whenever a bull that is known to be vicious, or one that behaves in a dangerous manner, is to be led, always employ two men. Each man may use a staff, each staff being attached to a separate ring in the bull's nose. A common method of leading such bulls is for one man to use the strong staff attached to one nose ring, while the other man uses a heavy strap snapped into a second ring. In either case, the men walk on opposite sides of the bull, keeping abreast of him, and forcing him to hold his head high.

Controlling The Use Of The Bull

Too early or too frequent use of the bull must be avoided, in order to obtain the best results. Do not allow the bull to be used for service before he is twelve months of age, unless he is much above the average in growth and development.

Until the bull matures (3 years of age), the number of females with which he may be mated during a season may be as many as he is months of age. Should the services of the young bull be distributed over as much time as possible, it is preferable that they should not occur oftener than twice a week.

The too-frequent use of the bull is often responsible for the failure of the cows to become pregnant and for an early decline in the vigour of the bull. Do not permit the bull to run with the herd except under special conditions.

Keep him confined to a box stall, yard, or pasture, by himself. Permiting the bull to run with the herd during the breeding season not only makes him impossible to determine the date upon which cows are due to calve, but also may seriously reduce the vigour of the bull.

Feeding The Mature Bull

The bull should be kept in good flesh by liberal feeding of concentrates, with ample amounts of good roughage. Provide pasture for the mature bull if possible. He should not be expected to secure all his feed from pasture, but he will be much better off if he has fresh green grass. If it is not possible to provide pasture, take a small amount of fresh grass or green crops, to the bull frequently.

As a rule grain mixture must be fed to keep the bull in good condition. Concentrate feeding is especially important during the breeding season. Feed 3 to 5 pounds of grain mixture daily depending upon bull's size and condition. Another rule is to feed 3 pounds of grain mixture daily for each 1000 pounds liveweight increasing this to a slightly heavier rate during the breeding season. If the quality of the roughage is poor, it may be necessary to feed more than this amount. Larger amounts are needed during the breeding season than when the bull is not being used for service. The feeding programme for the bull must be such that an ample amount of protein is provided, particularly during season.

Housing And Exercising The Bull

Often very little importance is attached to the kind of quarters and the opportunity for exercise given to the bull. Since the bull has a much greater influence on the success of the herd than even the best cow, he should be kept in the best of health and condition by means of comfortable quarters and regular exercise.

Provide a large roomy box stall or separate building for the herd bull. Do not keep the herd bull confined constantly in a stanchion or tied in a narrow stall. It is desirable to have a stanchion in the stall for confining the bull while the stall is being cleaned or while the staff is being attached. Further, do not keep the bull tied in his stall by means of his nose ring, as this makes his nose so tough that it is difficult to lead him with a staff. If it is necessary to keep the bull tied, provide an extra heavy neck strap made of several thickness of leather, with a large iron ring and heavy chain.

Arrange an exercising yard or paddock leading out from the bull's stall, so that he can be turned out for exercise daily. By having the yard in direct connection with the stall, unnecessary leading of the bull is avoided. See that the bull does exercises regularly. Some bulls, when young, may be trained to work and used just as an ox is used in drawing loads.

Managing The Herd Sire

Do not place too mature bulls together for exercise; one of them may be injured seriously. Check the nose ring of the bull monthly to be sure it is in good condition and replace when necessary. If at all possible, try to keep a potentially good sire until he is proved. In proving a bull, take the records from at least 5, and preferably his first 10 daughters, and compare them on the twice-a-day milking. Using your bull on cows from other herds may mean introducing diseases to your bull, such as Bang's disease, vibrofetus trichomoniasis, and many others. This can result in the loss of a good herd of cows from the transmission of such diseases through the diseased bull.

Readers Please !

A Special Coloured Illustrated Feature on Animal Husbandry in Bihar' Appears on Pages from 15 to 23.

"All our culture has been built on agriculture and agriculture has relied on the cow......A sense of gratitude makes people adore the cow......This recognition cannot be termed as (mere) sentiment, it is a 'fact' of our national life."

The Invaluable Services Rendered By

The Cow And Her Family To "The Family Of Man"

● by Shri Ismail Nagori

LIFE on earth presents a harmony of Divine Creation. We can secure the maximum advantage out of it if one can live and plan in a spirit in keeping with this harmony. If, however, we break the balance maintained by Nature we create problems. All the forces of the nature unite to supply us our needs. The sun, the rains, the winds, the sky join with the worms, bacteria and fungi of our soil and maintain her fertility. Even the deafening thunderstorms of lightning of the sky enrich the nitrogen resources of the Earth. The supply that they give exceeds total supply of all the factories of the world combined. The light of the sun travels through a space to help the leaf to synthesis starches and sugars, to provide warmth to the seed to germinate and to liberate food stored in the minute praticles of humble dust. The sun shines, the clouds rain, the rivers flow and the air maintains its sweetness not for Man alone. It would be impossible for human beings to live without their animal co-workers and even distant friends unknown. The breath of life would be fouled and poisoned if there were not the green friends of vegetable life. Plant life would not sustain without underground microscopic denizens of the soil who in turn depend upon other neighbours. It is a rich pattern of co-existence interrelation, symbiosis and mutual interdependence. The result is harmony and a luxuriance of life.

The Seers say 'All this is indwelt by the Lord' and science is slowly reaching this condition too. It is a compartmental view of life resulting in a selfish approach which creates problems. In our greed to make all others subservient to our convenience we have forgotten that there are creatures or insects which can be our cosharers, good neighbours, good comrades and good partners in a real sense. Take for example the cow. This bovine family has lived with us, has accompanied us in our migrations, has worked with us in early youth and in advanced age to save us from starvation. If it were backbreaking work of tillage we looked fit for help. If it was supply of food we have looked to it. Much of what we eat and put

on, and lot of what we use, we get all from this family. All our culture has been built on agriculture and agriculture has relied on the Cow. No wonder that a sense of gratitude made whole people adore the Cow. This recognition of what the family of the cow has done and still does for man cannot be termed a sentiment, it is a 'fact' of our national life. The ties of a joint life bind the two families together especially in the country side where eight out of ten of our people live. There they live and work together throughout life. To those who live in these villages and understand life there, the cow has solved many problems—the problem of help in work, problem of milk, curds, butter and ghee, the problem of manure and leather and what not. In the problems that yet remain or newly arise, her family stands by the farmer. Bapu called the cow 'a poem of pity' and to utilitarians she still stands reckoned as a property.

India today stands for peace, and for ages past, her spiritual teaching has valued sanctity of life. We might have faltered or failed but we have ever kept up our reverence for these high aspirations with unwavering faith. Our yearning to protect the family of the cow as a representative of our mute benefactors—is a token of our lofty thinking.

The cow is not only a poem of pity but is the mother of prosperity. It has for ages proved to be an asset to the country's economy. It has helped to grow food and other crops for the soil, kept up its productivity even after a long use, transported merchandise to far off places and all the time nourished the man behind the plough. Even today the place of cow in our national economy is a very high one. Of the nation's total income estimated at Rs. 9910 crores as much as Rs. 4580 crores are contributed by agriculture and animal husbandry. Approximately 50% of our national income comes from agriculture and animal husbandry. The contribution of animal husbandry is to the tune of Rs. 1104.3 crores. Add to this the gross value of bullock labour worth Rs 973.2 crores. It should be agreed that this important industry has great potentiality for development and the cow if well cared for will greatly add not only to our national economy but the prosperity of the nation as a whole.

Cow and Agriculture :—

Of the 80 crores acres of land returns of 72 crores acres are available. And of this 51% land can be used for agriculture and the rest is either under forest or not available for agriculture and therefore most of the food and other requirements produced from agriculture has to come from these 51 % land. Not only this population is increasing at a fast rate of 14% a year, but the man's needs are also increasing every day due to the increase in his living standard. This land has also to carry 20 crores heads of cattle being part and parcel of the human family. All this necessitates the adoption of practices that will raise the agricultural production of the country. Today our agriculture production has touched a very low line of efficiency. The results of the crop competition held in various parts of the country has shown that it is possible to raise the yield from 5 to 25 times according to various crops under well planned system of crop growing. This very land can carry more men as well as animal that at present.

Cattle increase the production of agriculture in two ways :—

1) by supplying motive power, 2) and by supplying manures. It is estimated that we have nearly 7 crores of bullocks which under

well managed conditions can produce energy worth 3 crores horse power a day. In addition to human labour bullocks are the main source of motive power on the farm and transport. For replacement of the 7 crores bullocks we will need the production of one crore of bullock annually.

The source for these bullocks is the number of cows, about 5 crores that we maintain. But with better management, better breeding and better feeding the same number can be produced with a lesser number of cows.

To replace the bullocks by machine power we will need nearly 40 lakhs of medium size tractors and another 6 lakhs annually for replacement. This would mean a huge amount of capital outlay. If the price of medium size tractor with implements is taken as Rs. 20,000 we will need 8,000 crores of rupees for the tractors and Rs. 1200 crores for replacement. Add to this the running expenses. All this has to be imported involving a heavy drain on our meagre foreign exchange. The country will also to be maintained by the farm on hard cash payment.

On the other hand the bullock is fed on mostly by-products of agriculture or forestry the labour involved being put by the farmer himself. The introduction of mechanical power will bring about forced unemployment among the agriculture worker and the country will have to find additional work for them. Again the bullock uses only 10% of the energy.

Cattle also help agriculture by providing useful organic manure. It is estimated that under well managed conditions 20 crores of bovine cattle can produce 40 crore tons of cow-dung.

It is well recognised that in the absence of humus in the soil, chemical fertilizers do more harm than good. There is a school of scientists who believe that crops grown on the organic manure are more helpful than those grown without them, due to the living conditions of the soil. The organic manure also helps to maintain soil texture, conserve moisture, stops soil erosion and checks land starvation. It is the experience of many farmers that chemical fertilizers leach out with heavy rains and burns the crop during draught.

By better feeding and management as well as by the introduction of scientific improvements it should be possible to raise the efficiency of these very bullocks by at least 30 %. Better bullock will mean better cultivation, higher production of grain as well as fodder which will ultimately mean more food both for the man as well as for the bullock. With scientific breeding it will also be possible to raise the efficiency of the bullock. It should be possible for the Indian cultivator to manage and improve his farming with 7 crore efficient bullocks, and should be possible under well managed condition to procure this number with 4 crore well managed cows.

Cattle also help agriculture by providing useful organic manure. The most practical means of keeping the fertility of the soil is the use of the farm manure.

The Dairy Cow :—

The cow also produces directly a nutritious food in the form of milk. The importance of the milk in human diet has been well recognised. It has a special place in a country where a large number live on vegetarian diet.

Others are non-vegetarian in the term as applied in the West. Here it only means that they can supplement their grains diet with non-vegetarian food. Milk, therefore, has special place in Indian diet. With limitations of land a thick and growing population it will become necessary for India to produce maximum food from the soil. Mr. Freeman observed that an acre of land will produce.

Animal food	*Pounds*
Beef	168
Mutton	228
Pig meat	300
Poultry	350
(Average 250/300)	
Cereal and Vegetable Crops	*Pounds*
Wheat, Barley etc	2000/3500
Beans Maize etc	3000/4000
Potatoes	20000
Carrots	25000
Swedes	30000

While under well planned dairy conditions, it should be possible even in India to produce 10000 lbs of milk from one acre of land.

In the country today we produce 46.1 crore maunds of milk for 3.2 crore milking cows and buffaloes, and the production of Goat milk comes to 1.7 crores maunds. The quality of our milking animals is far from satisfactory. The production of milk 361 lbs for the cow and 970 lbs for the buffalo is very low resulting in very low consumption of milk, 4.76 oz. per human being as against an essential requirement of 10 oz. whereas with the existing large number of cows and buffaloes in the country yielding more than 3,000 lbs of milk per lactation it should be possible to provide the required amount of milk even with a few milk producers. We have also many more mouths than what we can feed adequately and if the number is substantially reduced to 2/3rd of the present stock by controlled breeding, better methods of feeding management and suitable plan of crop production, it would be possible to substantially increase the production of our livestock within a reasonable period.

Even today cow can yield at least 50% more milk if adequately fed.

One of the reasons for these low yields is a very heavy number of animals we maintain. Many of the cows are not even milked at all. If the number is reduced to 4 crore as against 7 crore better feeding and management can be brought about which itself can increase the milk production by nearly 23 crore maunds. Weeding of the scrubs and better breeding has to play its part and with judicious planning it should not be difficult in near future to get an average of 1500 lb. of milk per year per animal. This will produce 75 crore maund of milk and double the per capita consumption of milk.

The dead cattle Industries :—

Another source of increasing the profits for cow keeping is the fuller use of the dead animals. Nearly 2.46 crores carcasses available every year are generally not fully utilized. So far as the utilization of carcasses of cattle, buffaloes and other big animals is concerned, it may be mentioned that the hides and about 60 per cent of bones are generally collected and the rest of the by-products, viz., meat, fat, horns and hoofs, etc., are allowed to go as waste. The carcasses of fallen sheep and goats, which are found in much lesser a number in comparison to cattle carcasses, are generally not utilized at all. An approximate estimate of the quantity and value of the various by-products that can be obtained from an average, carcass and also the approximate total value obtainable annually from the 2.46 crores of

carcasses in our country is given below.

Per average carcass		Total obtainable annually in the country	
Yield (in pounds)	Value (in rupees)	Yield (in pounds)	Value (in rupees)
400	23-0	6,77,76,00,000	40,03,85,600

Thus, with proper utilization, the 2.46 crores of carcasses can bring in about 40 crores of rupees to the country.

Due to the non-utilization of the various valuable by-products which could be obtained from the above carcasses, the net value of the waste comes to the tune of about 23.19 crores of rupees per annum. The details of the loss due to this wastage are Rs. 23,19,66,400.

Even the hides of fallen animals, which are the main products in our country, are very often spoiled to such an extent that they can not be converted into good quality leather. The annual loss sustained due to defective and deteriorated hides is estimated at about 3.39 crores of rupees (rupees two per hide). As such, the total net loss amount to 26.50 crores of rupees, i.e., about five per cent of the Annual Government Revenue (Accounts 1955-56).

The efficiency of the cow can be brought about by adopting the well known methods of weeding, feeding, breeding and organised marketing.

Weeding :—

It is a recognised fact that the standard of our livestock is very low and we have to feed many more mouths that we can offer. The result is a vicious circle and unless the number is kept under control, other methods will not produce effective results.

The total livestock population (30.65 crores) comprises of 5.54 crores. It is recognized that the Goat is a very destructive animal and is regarded as enemy No. 1 of plant growth. It thrives best under ranch condition and the goat keeper maintains it on somebody's else land. Its grazing habit also encourages soil erosion and formation of deserts and therefore in the interest of national economy it should be kept under control. A practical method would be the maintaining only those animals that pay for their upkeep under stallfed conditions. This will be possible if the goat produces milk as well as meat. By proper planning the present number can easily be reduced to a very great extent without detracting the milk production. With the development of the sheep it should be possible to maintain the meat supply. For our milk supply we are today maintaining two sets of animals. 1) the cow and 2) the buffalo. The she buffalo is marching over the cow in this field with the result we have to maintain the she buffalo for milk and the cow for bullock. and this leads to the premature death of the male of the buffalo and neglect of the female cow. With the increasing pressure on the land, it will not be possible to continue this practice for long, the only solution would be the evolution of a cow that can easily replace the she buffalo as a milk animal and at the same time continue to produce suitable bullocks. This can help in getting more for a smaller number of animals. As such 4 crores of cows each yielding 1500 lbs of milk per year can under better managed conditions keep up our bullock supply and nearly double the country's milk yield. This can reduce the total number by at least 1/3 of the population of cattle.

The standard of the cow in our different parts varies according to the circumstances they are put-in. An uneconomical cow of one place may be useful in some other place. In deciding the usefulness of the cow the country as a whole should be taken into account. ●

BIHAR STATE ANIMAL FAIR AT BARAUNI

BY

SHRI M. FAHIMUDDIN
Cattle Show Officer

THE construction of Rajendra Bridge across the Ganges near Mokama symbolises the successful efforts made to connect the cultural and industrial awakening in the State. Situated in the north of the Ganges, Barauni has attained country-wide importance. Here, on the one side are being carried out huge construction works viz: the establishment of a big power house for industrial consumption and the development of oil refinery etc. On the other, the Animal Husbandry department in the State is building a rural creamery.

It is obvious that for an all-round development it is essential that the health of the workers to execute work in these industries should also be good. They should have enough milk, *ghee* and other nutritive diet. The only medium of transport in this area is the bullock power. Therefore, they have also to be made stronger and their draught capacity has to be increased. Bullocks have to be used for transporting milk to meet the requirements of rural creamery. It was, therefore, very essential to create a feeling of healthy competition in the animal husbandry-men and also to acquaint them with the new techniques evolved in this field. Inspired by this feeling, the State Department of Animal Husbandry this time decided to hold its annual exhibition at Barauni.

The exhibition was arranged in the open ground of the creamery under the shade of mango and mahua trees. This atmosphere was very congenial and natural for the animals and animal keepers. The gate for the entrance was specifically artistic and decorative. The visits were very orderly and systematic. During the whole day and even upto 9.30 P.M. the farmers came in groups, showed keen interest in the exhibits and were very inquisitive about the new techniques and methods of animal husbandry. They showed special interest in silage preparation and improved methods of growing fodder crops.

In the exhibition, the bullocks were classified according to different breeds. The simple and enthusiastic villagers were specifically pleased to look at the healthy formation of their bodies and shining colours. The Hariana, Bachaur, Sindhi, and other animals were special attractions to the visitors. Bullock-cart race was very popular. The cultural shows and the exhibition of films attracted large crowds.

To encourage the farmers for increasing the milk-yielding capacity of their animals, special prizes were awarded. The cow adjudged the best yielded about 27 lbs of milk per day on an average.

The Animal Husbandry Department provided free-of-charge veterinary facilities together with appropriate feeds and fodder. One way railway fare was also paid by the authorities for bringing the animals as entrants to the livestock show.

A view of the exhibition

THE PROGRESS OF

THE state government has given an important place to the development of cow and its progeny in its developmental activities of animal husbandry. Breed improvement, disease control and the problem of improving the fodder resources of the State are being simultaneously attended to. But the presence of old and decrepit animals sometimes impedes the work of cattle development. These animals consume a substantial quantity of feed and fodder in the country which could otherwise be profitably utilised for productive and useful cattle. These animals suffer from some infectious diseases also and being weak and old are more prone to be effected by such diseases. In the unproductive cattle, the biggest number is that of low quality bulls left astray on religious occasions. These bulls adversely affect the next generation of cattle. Therefore, for appropriate development of cattle wealth, it is essential to keep the unproductive and useless cattle separate from the productive and useful ones.

According to 1956 livestock census in Bihar, the number of diseased and low-quality animals was about 3 lakhs. These present a serious economic problem before the farmers of the state. In the present-day circumstances, the establishment of Gosadans is the only alternative by which this problem can be partially faced. Hence, the Gosadans have been given an important place in the development schemes.

Gosadans are established at such places where natural grazing facilities are available. During the Ist and IInd five year plans, the following six gosadans were established in the state :—

FIRST PLAN PERIOD

(1) Nirmali (Saharsa district) with public efforts

(2) Mora (Monghyr district) with public efforts

(3) Barvadeeh (Palamu district) started by the state government.

SECOND PLAN PERIOD :

(4) Lachurar (Monghyr district) started by the state government.

(5) Kumaandeeh (Palamu district) started by the state government.

(6) Bareibroo (Singhbhoomi) started by the state government.

The cooperative societies, village panchayats

GOSADAN SCHEME IN BIHAR

and the individuals interested in cattle development activities have been requested to send the unproductive or decrepit animals from their areas to the nearest Gosadan. The expenditure incurred on the transport of these animals and also the amount spent on giving them feed and fodder etc. is re-imbursed by the State government to the concerned institutions.

During the IInd plan period, 9177 animals were admitted to these gosadans.

To make an economic use of the carcass of dead animals three tanning centres were started in the State. During the IIIrd plan, another tanning centre is proposed to be established. In this period, 15 collection centres and gosadans will be opened.

This short description would indicate that the gosadan scheme on the one hand helps in cattle development work and on the other it contributes to the state's income with the proper utilisation of the carcass of dead animals. It enjoins on the public a duty to help the State government authorities and other workers to send unproductive and decrepit animals to gosadans in larger numbers.

A view of a Gosadan in Bihar

PLACE OF ANIMAL HUSBANDRY IN THE ECONOMY OF BIHAR

by

SHRI S. K. SEN
Director, Animal Husbandry

BIHAR occupies an important place in the predominantly agricultural states of India. Eighty-six percent of the population still depends on agriculture for its livelihood. Therefore, animal husbandry has a vital role in the Bihar's economy. Livestock, therefore, is the base of the health and prosperity of the people. About thirty-two years ago, the Royal Commission, in its report on Agriculture, said thus :

"The people of this country are indebted to cow and her progeny, the bullocks—this is an accepted fact. Without bullocks, the agriculture in this country is almost impossible. The transport of products is also impossible without the bullock power."

According to the report of 1956 by the Bihar Economic and Statistical Directorate, during 1954, the share of livestock to the income of the State was about Rs. 264 crores. Broadly in this state livestock is used for these three purposes; firstly, animals are used for agriculture and transport. Secondly, these provide valuable natural manure for the production of food and cash crops, and thirdly apart from these, these give milk, etc.

Animals used for agriculture in the state, the cattle are the most important because they are directly connected with the occupation and livelihood of the people. According to the census of 1956, with regard to the cows and buffaloes in the state, it would be evident that about 44% and 18% respectively of their entire population is used mainly for agricultural operations and transportation in the rural areas.

Out of the contribution of livestock in the income of the Bihar State, their role on the fields and as a means of transportation are most important. On the basis of an estimate of rupee 1.25 np. per animal for ninety working days in an year it has been estimated that the animals contribute about an average value of Rs. 106 crores. This amount is about 40% of the total contribution of livestock to the State's income. Keeping in view the various crops grown in Bihar, local farming techniques and other economic aspects and the technique of field operations. it would not be possible to replace the cattle with other means. According to the livestock census of 1956, there were only 1227 tractors and about 16 thousand motor-vehicles used for agriculture as against 38 lakhs of ploughs and six lakhs of bullock carts.

The other aspect of livestock is intimately connected with the daily diet of the people. A large proportion of the population of this State still continues to be vegetarian. Their diet lacks protein of high nutritive value. Milk and other milk products are taken by all the

sections of the population in the State. From the point of view of public health and to keep the people healthy, this fundamental fact is very vital. In this state, about 4 oz. of milk is available per individual which is much lesser than even the minimum requirements for a healthy living. Under various schemes of animal husbandry, efforts are being made to increase the availability of milk from 8 to 10 oz. per head each day. The main purpose of these plans and projects is to improve the breed of cattle with the help of Hariana, Tharparkar and Lal Sindhi breeds of bulls. Obviously, the aim is to develop a dual-purpose animal that could not only give us milk but could also provide us with the necessary motive power to be utilised on farming operations and in other vehicles of transportation in rural areas. In this state, a pair of bullocks ploughs only about 7 acres of land while a Hariana or other higher quality bullocks can plough land upto 10 acres of land. With proper care and proper management, a cow of good breed can yield 1500 to 2000 lbs of milk in one lactation while the cows in Bihar give only about 620 lbs in one lactation. Efforts are being made to increase the milk yielding capacity of the cows and also the draught power of bullocks. To provide the urban population with pure and nutritive milk and also to give reasonable profit to milk-producers, specific milk supply schemes are being initiated in several cities.

In 1954, it was estimated that milk and milk products worth about Rs. 87 crores were produced in Bihar. This was about 33% of the total contribution of animal wealth to Bihar's national income. In the daily and normal diet of the people, milk, *curd* and *ghee* are very common. Other milk products such as butter and cheese etc. are not so popular in this State. The approximate value of *ghee* and *curd* prepared in the state is about Rs. 20 and 40 crores respectively. During 1955-56 about 27.67 mds of *ghee* were exported. With the progress of animal husbandry programmes, the yield of milk and other milk products will also increase. And with the improvement in the standard of people, there will be an increase in the demand of these commodities. Thus, as a result of increased production and consumption of milk and its products, the income of the state is also expected to go up.

Apart from helping us in agriculture, being the giver of milk and still continuing to be the basis of rural transport system, we get the most valuable natural manure from the cattle. No doubt, that chemical fertilisers are being used in the country but the need of using the natural manure still continues to be there and rather natural manure is more important. The natural manure is ideal for preserving the original fertility of land. The cow-dung available from local resources is estimated to be of a value of about Rs. 41.2 crores. Out of this, cow-dung worth Rs. 12.6 crores only is used as manure and the remaining quantity is burnt as fuel. Governmental authorities are well aware of this problem of saving this valuable manure going a waste as fuel. The peasants are told not to spoil cow-dung in their domestic use as kitchen fuel.

Besides these benefits and services of our livestock the animals go multiplying in numbers with the process of reproduction. This is also an important medium of income for the farmers. With the development of cattle-wealth in 1954, there was an estimated income of about Rs 17 crores from this source.

In the trade connected with the animal wealth, the bones, leather, skin, nails and wool are the most important. These commodities have a substantial share in the export index of the State. But there is a vast scope for the development in this aspect.

Several schemes are forging ahead and with increased quantum and enthusiasm the quick pace of progress is being maintained, especially with the launching of the IIIrd five year plan schemes. ●

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IN BIHAR

Animal Husbandry In The IIIrd 5 Year Plan

IT has been considered very essential to develop animal husbandry for the prosperity of the people and the sound economic set-up of Bihar. Agriculture, based on animal husbandry, is the main source of livelihood in this State. The livestock is the main source of supplying various materials such as bones, hides and wool for local industries. It is also the main source of supplying protective food in the form of milk, ghee, butter, cheese, etc. Besides all this, it is still the main source of transport. The State Government has therefore made a provision of Rs. 6.80 crores to implement the different schemes of Livestock development under the 3rd Five Year Plan taking the above facts under consideration.

There are 75 schemes for the development of livestock under the Plan. Fourteen of them relate to cow-development. The primary aim of these schemes is to make farmers and herdsmen economically sound through raising their income from livestock. That is why, it has been decided to have schemes devoted to the problems of breed improvement, feeds and fodder, disease control etc.

Under Bull distribution scheme 2190 improved bulls shall be distributed. An additional provision of Rs. 29.88 lakhs has been made for this work in 3rd Five Year Plan. An additional provision of 9.34 lakhs has been made to supply the improved bulls to in-breeding regions where the work had been started earlier. In addition to this, some new bull-rearing centres shall be established and an amount of 10.12 lakhs has been sanctioned for this purpose. But the above number of bulls may not be able to cope with the requisite demand of the whole state. Therefore, it is decided to depend largely on artificial insemination. It is estimated that Rs. 68 lakhs and 45 thousands shall be needed to continue the present centres and sub-centres in the next five years. Key-Village Scheme shall be expanded with the object of rearing improved bulls. Besides giving grants to the villagers for rearing bulls, a wide propaganda for improving breeding is launched by establishing artificial insemination centres in big cities. This shall be continued in 3rd Plan also and an amount of Rs. 58.69 lakhs has been sanctioned for this scheme. Goshalas may prove very useful to a very great extent for improving cow's breed. They (Goshalas) can be developed in form of small dairies. With this idea, Government has provided Rs. 4.67 lakhs in 3rd plan for encouraging the castration of scrub bulls. These are to be sent to Gosadans.

(*Contd. on page* 23)

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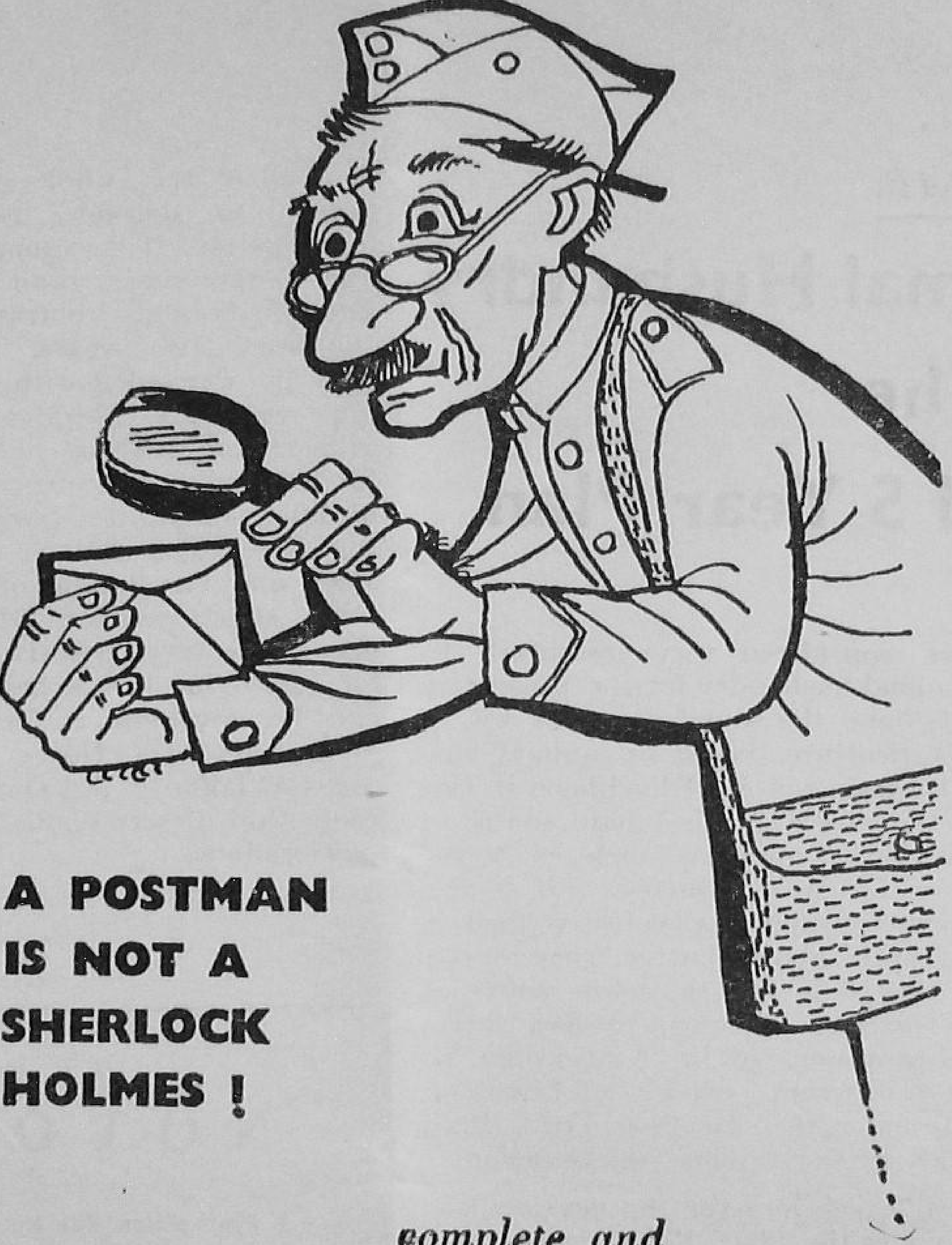

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(*Contd. from page 21*)

PROPER FEEDS AND FODDER :

Next to improvement in breeding, the other important problem is the management of proper feeds and fodder. The expansion of departmental fodder schemes is also under purview of this plan for supplying fodder according to need. Under Key-Village Scheme a provision for development pasture land, demonstrations of pasture plots and distribution of chaff-cutter has already been made. An expenditure of Rs. 8.91 lakhs has been estimated for all these items under the Key Village Scheme. The provision of Rs. 1.16 lakhs has already been made for the establishment of hay production centre and appointment of maximum number of technical personnel for fodder development schemes. Some concrete and important steps shall be taken under the III plan for supplying authoritative technical advice to the farmers and herdsmen regarding growing green fodder.

CONTROL OF DISEASES :

There are 619 Vety. Hospitals and dispensaries in the State for checking the diseases of livestock. A scheme has been prepared for expanding 23 Vety. Hospitals of grade one & 18 small dispensaries to combat the spread of local diseases and epidemics. An additional provision of Rs. 41.09 lakhs has been made for this purpose. Medical relief work for livestock is being administered on very extensive lines in Community Project areas. A provision of Rs. 5.63 lakhs has been made to expand Rinderpest Eradication Scheme to make free animals from this epidemic.

DAIRY DEVELOPMENT :

There are about 14 schemes of dairy development. The provision of Rs. 212 lakhs has been made for this purpose. The schemes of milk supply, dairy development, expansion of present dairy development projects, assistance for purchasing milch cattle and organisation of milk cooperative societies shall be extensively executed during the IIIrd plan.

EXPANSION OF DAIRY AND VETY. EDUCATION :

Technical personnel shall be required to achieve the targets of these schemes. Therefore, special attention has been given for expanding the facilities for technical education of Dairy and Vety. Besides Rs. 5.24 lakhs of Govt. grant for animal husbandry school at Goriyakama, State Government has also sanctioned Rs. 10.20 lakhs for another livestocks training centre. An additional provision of Rs. 49.08 lakhs has already been made for the expansion of Dairy and Vety. College at Ranchi which was established during 2nd Five Year Plan.

In the 3rd Plan.a provision of Rs. 7.73 lakhs has been made for starting cattle rearing centre and a research institute at Darbhanga.

INFORMATION AND EXTENSION SERVICES :

It is essential to acquaint farmers, herdsmen and general public with the modern scientific techniques and departmental achievements. Therefore, State Government has sanctioned Rs. 9.48 lakhs for the establishment of an information and extension unit of animal husbandry during the 3rd Five Year Plan.

Thus, on the basis of these Government efforts for development of livestock, it may be hoped that the farmers and herdsmen will make their economic conditions prosperous by sufficient earnings from livestock in the next Five Years. The success of these schemes depends on the cooperation of the people. It is expected that peasants and herdsmen shall be profited by extending their maximum cooperation to all These schemes. ●

MILK and Milk Products

by
H. J. MAKHIJANI

In India, consumption of milk and milk products is very much below the nutritional requirements of a balanced diet. Why this is so and how production, processing and marketing facilities could be improved is explained in this article. The extensive range of information presented includes a comparative picture of the nutritive value of different milk products.

IN many animals, classified as mammals, the new-born feeds for a time solely on milk produced by the mother. For the young, therefore, milk is a complete food. In fact, milk is the most complete of all foods, containing the various essential nutrients and is regarded as an ideal food for infants and a valuable supplementary food for children and adults. It is, however, deficient in iron and contains only a small amount of vitamin C. A committee of the League of Nations on the problems of Nutrition had recorded on the dietary value of milk as under :—

"Modern scientific research has entirely confirmed the empirical conclusions drawn from human experience as to the dietary value of milk. Milk which is designed to afford complete nutrition to the mammalian young, is known to contain all the factors needed for satisfactory nutrition, combined in a suitably proportioned mixture.........Milk is the nearest approach we possess to a perfect and complete food, and no other single food is known that can be used as a substitute."

Milk and milk products have been considered as the food worthy of gods and used in their worship for countless number of years. Since the Vedic period the cow has been symbolised with the "beams of dawn" and "rainy clouds", and those milking with ease and yielding aboundant milk and ghee were prayed for. The milking of cows, making of curds, butter and *ghee* were domestic duties ot every-day importance; besides being offered to gods, these comprised the daily food, both by themselves and in many forms in mixture with other foods. The cow was a symbol of wealth and milk, butter and *ghee* the symbols

of prosperity. Indeed, cow, the giver of nourishing milk has been the foster mother to mankind.

"Do you, cows, give us nourishment, restore the emaciated unlovely body to health and beauty."

(Atharva Veda; 123.6)

According to an F.A.O. study, man has used milk of various domesticated animals as food, namely, of the cow, buffalo, sheep and goat and to some extent of the camel, reindeer, mare, ass, and Illama. These animals are herbivores and ex ept for the mare and ass, other are ruminants. They nourish themselves on coarse plant food not directly utilised by man. Through careful breeding, better feeding and management, milk production of the more important milch animals namely the cow and the buffalo has been substantially raised in excess of the quantities needed by the young.

In India, both the cow and buffalo are important in providing milk for human consumption. The milk of goat, sheep and to a lesser extent that of camel and ass is also used. Goat milk is used in most parts of the country constituting about 3 per cent of the total for the country as against about 52 per cent provided by the buffalo and 45 per cent by the cow. No estimates are available of the quantities of milk from the sheep, camel or ass used as human food in the country. The use of milk from the camel is known to be confined particularly to parts of Rajasthan and Gujarat, while that from the ass is reported to be used to some extent in parts of Gujarat. Sheep milk is used more widely than that of the camel or ass and is largely confined to hills and grazing areas where large flocks of sheep are to be found.

Outside India, the cow is the main source of milk supply. The buffalo is also found in some of the countries. The goat is particularly important for supplying milk in Arabia, Spain, Southern Europe and Latin America. Sheep milk is used in comparatively large quantities in southern and central Asia and south-eastern Europe. The milk of camel is relatively important in Arabia. Reindeer milk is used in Lapland, Finland, Greenland, Iceland, Alaska and northern parts of Canada because of the absence of other species. In parts of Central Asia, the mare is reported to be used for supply of milk for the peasantry. In Andes, llama milk is utilised. It is possible that there are places where still different species of mammalia are used to supply milk for human use.

Milk of different animals varies significantly in composition. The German physiologist Bunge is reported to have observed some 70 years ago that more rapid the development of the young, higher the content of protein in milk of the species and nearer the composition of mineral matter of milk to that of the new-born. The composition of milk of some mammals is indicated in Table I.

TABLE I

Percentage composition of milk from some Mammals

Species	Water	Fat	Protein	Sugar	Ash
Human	88.50	3.30	1.30	6.80	0.20
Cow	86.55	4.97	3.18	4.59	0.74
Buffalo	83.23	7.44	3.78	4.88	0.78
Goat	86.88	4.07	3.76	4.64	0.85
Sheep	79.46	8.63	6.68	4.28	0.97
Camel	86.57	3.07	4.00	5.59	0.77
Mare	90.68	1.17	2.08	5.77	0.36
Ass	91.56	0.62	1.39	6.10	0.28
Reindeer	68.20	17.10	10.40	2.08	1.50
Ilama	86.55	3.15	3.90	5.60	0.80
Elephant	67.85	19.57	3.09	8.84	0.65

"DO YOU, COWS, GIVE US NOURISHMENT, RESTORE THE EMACIATED UNLOVELY BODY TO HEALTH AND BEAUTY"

(Atharva Veda ; 123.6)

It has been seen that composition of milk varies significantly from one species to another. It is also known to very to some extent within different breeds of the same species and to a smaller extent between indiduals of the same breed. The factors that determine the composition of milk are : species, breed, physiological variability of an individual, nutrition, stage of lactation, age, health and season of the year.

Milk of any species which is the ideal food for the young of its own is naturally restricted in value when used by another species. The limitations of milk of domesticated animals in human nutrition are thus obvious. Nonetheless, milk has been one of the sheet anchors of proper human nutrition. In fact, consumption of sufficient quantities of milk may be regarded as key to proper nutrition and nutritional experts have recommended minimum and optimum levels of milk consumption for balanced diets.

PRODUCTION AND REQUIREMENTS OF MILK :

India ranks as third in the production of milk which is estimated at 5282.57 lakh maunds annually (1956) being surpassed only by USA and USSR. The per capita daily consumption of milk including milk products has, however, been estimated at 5.2 oz. for the country as a whole, varying from 14.75 oz. in the Punjab to less than 3 oz. in Assam, Kerala, Orissa, West Bengal, Manipur and Tripura. The per capita daily consumption of milk in some of the other countries has been estimated as New Zealand—26 oz., Canada—23.5 oz., USA—22.5 oz., U.K.—19.5 oz., Australia—17.5 oz., West Germany—16.2 oz. and France—15.8 oz. As increased consumption of milk contributes to well-being of the peoples and ensures national health even in those countries, programmes have been initiated from time to time to encourage greater consumption of milk, particularly among children and people in low income groups.

The Nutrition Advisory Committee of the Indian Medical Research Association has recommended a minimum daily consumption of 10 oz., milk as necessary for a balanced diet, the optimum level of consumption having been placed somewhat higher. This indicates that a two to three-fold increase in milk production is called for. The draft Third Five-Year Plan envisages a 15 per cent increase in milk production by 1965-66.

Though we have the world's largest share of cattle and buffalo population, there is a shortage of milk mainly due to low milk yields, estimated at 382 lb. per year per cow and 1117 lb. per milch buffalo. Under good management and proper feeding our cattle have given average lactation yields of 2500 to 3500 lb. milk after suckling the calf and buffaloes 3000 to 4000 lb. milk. There is, thus, considerable scope for raising the milk production. The main factors limiting increased milk production have been the inadequacy of feed and fodder resources, lack of organised marketing systems, perishable nature of milk and milk products, incapacity of farmer to provide proper housing and management for

his herd and limited credit facilities. The animal Husbandry and dairy development programmes and mixed-farming schemes proposed under the Third Five Year Plan aim at removal of those handicaps through assisting the farmer in increasing his feed and fodder resources, improving the productivity of his herd through better breeding and disease control, developing an organised demand for milk and its marketing on cooperative basis, setting up milk processing and manufacturing units to minimise losses through spoilage, providing loans for purchase of milch cattle and also demonstrating the advantage of mixed-farming in raising the productivity both from land and livestock and thereby improving the living standards of the farmer.

FACTORS AFFECTING THE LEVELS OF MILK CONSUMPTION :

The level of consumption of milk and milk products as one of the important food items is governed by various factors, namely, the availability of clean and wholesome milk and milk products, their prices, number of members and their age-groups in a family, the dietary habits, levels of income, etc. The price of milk and milk products in relation to income levels of people is one of the important determining factors. As it is, people in the higher income groups generally consume comparatively more milk and milk products than those in the lower income groups. Larger families particularly those having more children, usually consume more milk than smaller families. The dietary habits and the availability of wholesome products are other important factors. In certain communities, their diets invariably include some quantities of milk, curds, ghee and lassi. In others, some quantities of milk, butter or cheese and puddings are common ingredients of their diets. Availability of wholesome milk at comparatively low prices and an educative propaganda regarding its nutritive value could contribute in a substantial measure to an increase in the consumption of milk.

UTILISATION OF MILK

Of the annual milk production of 5282.57 lakh mds. (1956) it has been estimated that 2065.82 lakh mds. or 39.1 per cent only is used for fluid consumption while as much as 2103.10 lakh mds. or nearly 40 per cent is converted into *ghee*. Of the remaining, 478 54 lakh mds. is utilised for *dahi*, 314.57 lakh mds. for butter-making, 239.85 lakh mds. for *khoa* and the remaining 80.69 lakh mds. utilised for ice-cream, cream, *malai*, *channa* and other products. The large quantity of milk converted into *ghee* and other milk products indicate lack of demand for fluid milk in the more interior villages. In certain communities there is, however, some prejudice against selling milk which is gradually being overcome. The return to the farmer per maund of milk as *ghee* or *khoa* or other indigenous products is somewhat lower than for milk sold for fluid consumption. The estimates regarding utilisation of milk for the year 1951 and 1956 are given in Table II.

TABLE II

Utilisation of milk in India for 1951 *and* 1956

(*In Mds.*)

Milk	Quantity of milk utilised 1951	1956
Total production	466,350,933	528,257,132
Consumed as fluid milk	182,253,731	206,582,601
Converted into—		
Ghee	186,986,278	210,309,976
Khoa	20,598,318	23,985,172
Butter	27,973,765	31,457,032
Dahi	41,247,834	47,854,400
Ice-cream	2,182,532	2,478,648
Cream	3,356,626	3,817,741
Other products	1,749,849	1,771,562

According to an investigation into the cost of milk production in Delhi State undertaken by ICAR during 1952-53 the cost of production for rural areas worked out to nearly Rs. 0.48 per seer of milk. Using this data and the general rise in prices that has taken place, the cost of milk production in different rural areas in North India is likely to vary from Re. 0.40 to Re. 0.50 per seer. Against this, the selling prices of milk in rural areas generally range between Re. 0.37 and Re. 0.45 per seer and the return for milk utilised for *ghee* and other milk products is likely to be somewhat lower. This indicates the possibility that in many of the holdings, under the existing conditions, milk production might not be quite remunerative. The farmer, however, continues to maintain milch animals as sale of milk and milk products provides him with much needed cash for his daily needs though it might be rather uneconomic. For the welfare of the large community of farmers, utilisation of milk for fluid consumption needs to be expanded to the greatest possible extent.

NUTRITIVE VALUE OF MILK PRODUCTS

The popularity of milk as an item of food has led to its serving in more palatable forms singly or in combination with other foods and conserving surpluses in the form of products having better keeping quality. Except for losses, which inevitably occur, the constituents contained in the original milk are recovered in the final product. A single product, however, contains all or only a part of certain constituents in concentrated form, while the remaining constituents are recovered as by-products e.g. butter and separated-milk, *makhan* and *lassi*, *chana* and whey. Some of the common milk products used are briefly described. The average composition and Calorific value of various products is given below in Table III.

TABLE III

The Composition and Calorific Value of Milk and Milk Products

Products	Water %	Fat %	Protein %	Lactose %	Ash %	Added sugar %	Calories per lb.
Milk :							
Cow (Red Sindhi)	86.56	4.92	3.21	4.58	0.752	—	342
Buffalo (Murrah)	83.59	7.16	3.77	4.81	0.765	—	447
Milk products :							
Cream (cow)	—	50.00	1.67	2.39	0.39	—	2.112
Cream (buffalo)	—	50.00	2.03	2.60	0.41	—	2,112
Butter (salted 2.50%) ...	15.00	81.50	0.60	0.20	0.10	—	3,337
Butter (unsalted)	15.20	83.50	0.75	0.25	0.15	—	3,442
Cheddar Cheese	33.89	33.00	27.56	—	3.65	—	1,845
Ghee	0.10	99.80	—	—	—	—	4,078
Malai	—	27.50	3.20	3.60	0.40	—	1,244
Chhana	—	30.00	17.50	2.20	0.30	—	1,580
Khoa (whole milk)	—	36.00	18.00	30.00	5.00	—	2,337
Plain Khir (sweetened) ...	—	20.00	10.00	16.00	2.60	24.00	1,721
Plain Khir (unsweetened) ...	—	26.00	13.00	20.00	3.30	—	1,658
Plain Khir (from skim milk)	—	5.00	11.00	18.00	2.70	20.00	1,092
Rabri	—	20.00	10.00	17.00	3.00	27.00	1,794

Table III—*contd.*

1	2	3	4	5	6	7	8
Dahi	—	6.50	3.30	4.90	0.70	—	414
Lassi (skim milk)	—	0.07	3.40	5.00	0.72	—	155
Malted Milk (Horlicks) ...	—	8.10	14.80	10.04	3.96	—	780
Whey	—	0.38	0.86	5.00	0.76	—	122
Dry whole milk	—	26.00	27.20	36.80	6.00	—	2,220
Separated or skim milk ...	—	0.15	3.72	4.98	0.80	—	164
Sweetened condensed skim milk	—	1.01	9.14	18.18	2.05	40.58	1,277
Dry skim milk	—	1.00	37.40	49.20	8.40	—	1,610
Butter milk (commercial) ...	—	0.50	3.30	3.40	0.65	—	142
Mattha	—	0.50	3.40	5.00	0.72	—	173
Dry butter milk	—	5.87	38.74	39.91	7.68	—	1,665
Condensed butter milk ...	—	1.30	9.90	11.70	2.00	—	444
Evaporated whole milk ...	—	9.10	8.75	12.74	1.94	—	760
Evaporated skim milk ...	—	0.75	8.35	12 50	1.78	—	408
Ice-cream (good average commercial mix)	—	12.50		10.00		16.00	983
Ice- cream (home made mix without eggs and flour) ...	—	13.00	2.47	3.52	0.58	14.00	892

GHEE

Ghee is clarified butter-fat and the best form in which a main component of milk could be conserved under our climatic conditions. It is used in the Indian home as a cooking medium and contains 98 to 99 per cent butter fat. Very little vitamin A is lost during proper manufacture. Losses may, however, be marked in over-heated samples and during storage. The fat of ghee is almost completely digestible and its texture and palatability makes it a very desirable dietary component.

BUTTER

The art of butter-making is an old one and references to it occur in ancient literature. There has been a substantial advance in butter-making technology thereby making available high-grade table butter. Butter contains about 82 to 84 per cent fat which is almost completely digestible. Butter or *makhan* churned directly from milk curds, however, contains 75 to 80 per cent fat. Its nutritive value and palatability make it a very desirable dietary component.

LASSI

Lassi is the name given to sour butter-milk ramaining after churning of butter or *makhan* from *dahi* in the manufacture of ghee and contains milk proteins and minerals and also water-soluble vitamins. It is a healthful and colling drink and helps to establish lactic acid flora in the intestines.

DAHI

Dahi is the curdled milk characteristic of our country and possesses more or less the nutritive qualities of the milk from which it has been made. The change of lactose into lactic acid slightly decreses the calorific content of the product. The vitamins, on the whole, survive quite well. Souring and formentation of milk helps to make it safer and wholesome under our climatic conditions. It is believed souring inhibits and later destroys many pathogenic bacteria in milk, particularly typhoid and paratyphoid organisims and coli forms.

KHOA

Khoa is concentrated milk obtained by boiling milk in an open *pan* or *karahi* until a dough-like mass remains. Almost 80 per cent of water in the milk is removed in the process, giving the total solid content in Khoa as 80 to 85 per cent as compared to 13 to 16 per cent in the milk. It is a wholesome and nutritious food containing various milk constituents.

KHIR

Khir is prepared the same way as *khoa* except that the boiling process is continued only until the volume of the milk has been reduced to about one-third, the final product being somewhat viscous. Whole or cracked rice, certain other cereals, sugar and dry fruits etc. are generally added to the milk while it is boiling. *Khir* is a wholesome and nutritious milk preparation commonly used in Indian homes.

RABRI

Rabri is a concentrated product made by skimming off successive layers of clotted cream from simmering milk. Milk is stirred as little as possible and skin formation is encouraged by fanning the surface of the milk during heating. When milk left in the pan is about one-sixth to one-eight of the original volume, sugar is added to it at the rate of about 2 oz. per seer of milk. The skimmed-off layers of clotted cream are removed from the sides of the pan and immersed in the sweetened milk. Rabri is a wholesome and nutritious milk preparation.

MALAI

Malai is obtained by separating the layer of clotted cream from the simmering milk. It is rich in fat upto 25 to 30 per cent and contains milk proteins, lactose and minerals in the serum part in about the same proportion as in milk. It is generally sweetened and taken with bread or *chapati*.

CHHANA

Chhana is prepared from milk by precipitation of protein with the help of either sour whey citrus fruit juice or citric acid solution while the milk is boiling. Soluble material, principally the ash, lactose and soluble vitamins of the milk pass off in whey, while the protein and fat constitutes chhana. The average yield is about one-fifth of the milk used.

CREAM

Cream is a portion of milk rich in fat, seperated by skimming or contrifuging. It should contain fat not less than 18 per cent and anything upto 50 to 60 per cent known as 'thick cream' or 'double-cream.' The serum or non-fatty portion of the cream is the same as in the original milk. Cream separation is an intermediate stage in butter making, but some quantities are also used for ice-cream making and for table purposes. Its nutritive value is that of its two components, the fat and non-fatty or serum portion.

SKIM-MILK

Skim or separeted milk is that portion of milk which remains after most of the fat in milk has been removed by centrifugal separation or skimming. The amount of fat left is about 0.05 to 0.1 per cent in the case of machine separation and 0.5 to 1.0% in the case of skimming. Skim-milk retains all the valuable non-fatty solid, in milk proportionately increased on dry weight basis by removal of fat.

ICE-CREAM

Ice-cream is a frozen product of milk rich in milk fat (about 12 per cent) as well as in milk solids (about 10 per cent) with added sugar, stabiliser and flavour. The nutritive value of ice-creams depends on the content of their ingredients. Ice-creams are palatable source of milk constituents.

From

Agricultural Situation in India

A HEART TO HEART TALK BY THE CHIEF EDITOR

making COW the MOTHER of PROSPERITY

SINCE the beginning of this series, an attempt has been made to study the cow against the background of our culture, economics, and science. We have also seen the practicability of the case and if we are now convinced that our future prosperity greatly depends upon the cow, we must then necessarily find out ways and means of making her the mother of prosperity.

THE CONDITION OF THE COW :

But this has been one aspect of the question and a very important too. But we cannot afford to ignore the present position of the cow. Even after giving her such a high place in our socio-economic structure, how do we find her condition today? Many of the scientists believe that a very large number of our cows are of non-descript type and very poor producers. These are not worth their feed and upkeep. For maximum utility, the machines and the buffaloes are preferred. The rearing of cow and the care of the dry cow is becoming a problem which results in the increase of stray-unwanted cows; and thus the rearing of cows is more or less an undependable occupation in terms of economic returns. Many of the cows that go to the cities for the production of milk get disabled, and some-times sent to the slaughter houses. Their salvage has become the basic problem. The masses generally prefer buffalo milk and even tonned milk. Sometime back an economist while studying the problem of cow slaughter had expressed that most of the slaughtering is done in the country for hides. These hides are tanned and used for leather goods.

How many of us who oppose cow slaughter in the country refrain from the use of these goods ?

THE APATHY TOWARDS FEMALE CALF :

We have seen that the cow is primarily kept for the bullock she produces. Majority of our cow-keepers are not very much interested in the milk yield of the cows. If a female calf is born, even the little milk that the cow yields is milked out, resulting in the under-nourishment of the female calf. She grows under mal-nutrition conditions and surprisingly the owner expects a sturdy and powerful bullock from this cow.

Due to a variety of reasons the investment from agriculture is being diverted to other industries that promise better dividends; and thus gradually crop growing is going into the hands of those who cannot profitably invest in agricultural pursuits. The bullock has therefore come under the care of those cultivators who have not sufficient means to maintain them well. Some time it is also argued that a sturdy bullock is beyond the reach of an average cultivator, hence we should not concentrate towards this aspect. The poor cultivator only needs a small bullock and the country has to be contended the way in which it is maintained. A small bullock means smaller implements, shallow cultivation and reduced yield which ultimately reduces the earning capacity of the man behind the plough. But the country cannot afford to starve. Highest yields are to be obtained and therefore the best course would be to introduce agricultural machinery and transferring agriculture into the hands of those who are well placed in terms of agricultural investment. We can then visualise that sturdy bullocks under well-managed conditions coupled with developed implements and bullock driven machinery can turn out efficient work and increase the production of the soil. It will improve the lot of our agriculturist.

THE MILK PRODUCTION :

In the sphere of milk supply; the position is quite unsatisfactory. With the largest number of livestock in the country and with a large population that depends upon milk and milk products for animal protein, the consumption of milk in India is the lowest. Comparative figures from different countries will make this position quite clear.

Country :	*Human population (in thousands)*	*Cattle population (in thousands)*	*Milk consumption per capita (oz)*
Australia	8478	15229	44.4
Brazil	53377	52655	—
Canada	14009	8292	56.8
Argentina	17644	41268	—
India	356829	155100	6.6
Newzealand	1947	5097	60.0
U.S.A.	154353	84179	54.2
Denmark	4304	3110	40.3

NEED TO DEVELOP DUAL-PURPOSE COW:

We have evolved out a very peculiar system

> ***"………If we are now convinced that our future prosperity greatly depends upon the cow, we must then necessarily find out ways and means of making her the mother of prosperity in the real sense….."***

of maintaining animals on the farm—the cow for the bullock and buffalo for milk. How does it suit to our present day circumstances when food of every kind is in some short supply. The male of the buffalo is allowed an untimely death because it is of very little use and the female calf of the cow is neglected because good quality of milk is not expected out of it. The only solution to this problem is the maintenance and development of an animal that could give sturdy bullocks for the farm and good quantities of milk for home as well as for market—a dual purpose animal. Such an animal in most parts of the country can be the cow only and in those few parts where the cow does not thrive, the buffalo will produce milk as well as he-buffalo.

CARCASS UTILISATION AND MANURE PRODUCTION :

In respects of manure and utilisation of dead animals, things are in a worse state.

We all know that cow-dung and urine make a perfect food for the growing plants. But do we ever think as to how much we loose by the neglect of urine. A major portion of our cattle dung is burnt. We do not utilise the carcasses for the production of wealth. A greater part is not only wasted but allowed to create unhealthfi atmosphere. This very important industry with high potential has been all along left in the hands of the poor harijans. With the progressive development of this community, the utilisation of the carcasses is even becoming a serious problem. The harijans would not touch the dead animals as he is afraid of losing his caste. The result is wastage.

ROLE OF THE PANCHAYATS :

Every member of the Panchayat should study the condition of the animals and the animal industry in his jurisdiction. It has been agreed to that we cannot do without the cow. She is our mainstay. But the cow as it exists today is not the ideal type of the cow we require. The cow has to be developed and take an important place in the society. How can that be done has to be studied and acted upon. Let us pool the experience of centuries which we have gathered, make best use of our sentiments, test these on the touchstone of practicability and utilise the science of cow-keeping evolved out by the world's scientists and make the cow the real mother of prosperity.

—Y.M. PARNERKAR

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